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THE GENESIS OF SPEECH.

If I have departed from tradition in using in my title the word *genesis* for the word *origin*, the substitution is not without reason. There are many persons to whom the latter word is fatally suggestive; they cannot hear it applied to speech without thinking forthwith of an invention or discovery; they tend under its influence to conceive of speech as coming into existence under the conditions and through the agencies which went to the making of Volapük and Esperanto; it is almost as if they imagined some clever troglodyte of primitive days saying to his fellows: "A happy thought strikes me; let us invent a language."

"Genesis" will, I hope, suggest a different view; it presents speech not as an invention, but as a process, not as an abrupt, but as a slow and gradual coming-into-existence,¹ like the evolution of man himself, proceeding

¹ I am not unmindful of the claims of the mutation theory, which Professor A. H. Pierce has already applied tentatively to the explanation of gesture and other modes of expression (*Jnl. of Philos., Psych. and Sci. Method*, vol. 3, p. 573), and which Professor Manley has used analogically (and perhaps a little prematurely, if ingeniously) for the interpretation of literary history (*Modern Philology*, vol. 4, p. 1); but as the theory is still in its inception, and liable to sweeping modifications, I have thought it best to hold for the present purpose to the older view.

without a break from beginnings crude and humble and scarcely recognizable, yet not contemptible, to the rich and complex function of the present day.

Like every other complicated human phenomenon, speech may be defined in a variety of ways, according as stress is thrown upon the physical, the physiological, the psychical, or other aspect of it. For my part, since I wish to simplify the problem of its genesis as much as I can, I shall reduce it to its lowest, most nearly physiological, terms. I shall therefore assume for the present that whatever else it may be, it is for my purpose merely a peculiar movement of certain organs of the body—a series of muscular contractions of the thorax, the throat, the tongue, the lips, etc. Disregarding other equally interesting questions, I shall ask how these movements are related to other bodily movements and how, in the history of early man, or his precursor, they arose, developed, and attained their peculiar character and significance.

We may begin by considering the general categories of bodily movement.

Bodily movements may be divided into two main classes: 1) life-serving movements, or utility accommodations, as the biologist terms them, and 2) expressive-communicative movements. The first class comprises those whose primary function is to maintain and promote the life of the bodily organism. In the lowest orders of creation all movements are thought to be of this class, for all contribute in some way to the animal's well-being. If the creature expands or contracts, if it reaches out or draws back, if it attaches itself to objects or lets go of them, if it undulates, or quivers, or moves from place to place,—in every instance, the origin and meaning of the movement is the preservation, furthering, or propagating of the little life. The organism has no other desire, no other ambition,

no other destiny. That it may have physical life and may have it more abundantly sums up the purpose of its being—so far as nature, from the evolutionary point of view, may be said to have any purpose at all.

As the organism becomes more complex and its inner and outer structures are differentiated, two sub-classes of life-serving functions may be distinguished, to which I shall give the names *covert* and *overt*. Under covert processes will fall physiological functions which, going on within the cavities of the body, are ordinarily hidden from observation. The secretion of bile, the beating of the heart, the movements of the white and red corpuscles of the blood, will serve as examples of these. On the other hand, we may reckon as overt processes those obvious movements of the head, limbs, trunk, or body as a whole, which are necessary in obtaining food, escaping from harmful agencies, or securing a more favorable environment. Under this head we may bring also the various strains in which muscles are set to resist attack or prepare for flight, although these are more properly denominated attitudes.

To this large category of life-serving movements, embracing both covert and overt movements, is often applied the term *useful*.

If the first category includes movements which promote individual life, the second includes those whose purpose is primarily to manifest this life and convey an apprehension of it to others, that is, to express and communicate.¹

¹ Although the two classes have been thus marked off from each other there is a sense in which all overt movements may be said to be at one and the same time life-serving and expressive-communicative. The life-serving function of eating, for example, when it is performed by persons

“Feeding like horses when you hear them feed,”

both expresses hunger and communicates the idea of hunger to others. The provincial guest at a hotel who with his fork spears a slice of bread on the

Examples of such movements are gnashing of the teeth and rolling of the eye-balls in rage, exposing of the canine tooth in scorn, setting of the lips in decision, shaking of the head in negation, shrugging of the shoulders in doubt, elevation and depression of the corners of the mouth in joy and grief respectively. Here belongs, generally speaking, the whole round of gesture, pantomime and grimace. And here, finally, belong the phenomena of speech.

Movements of this type, compared with life-serving functions, are termed *useless*, and in one sense they are so: they do not promote directly the life of the bodily organism. They can be suspended, as the life-serving functions cannot, without injury to the body. A man may sit quietly in a chair, or lean against a lamp-post, or lie asleep in his bed, not only without speaking or laughing or crying, but without moving his head or his limbs, or (with one important exception which will be noted later) in any other way giving sign of his presence. He may in this passive condition preserve his bodily integrity for an indefinite length of time. More than this, he may, if he is alone, dispense altogether with the class of movements which we term communicative. To this extent movements of expression and communication may with some degree of truth be said to be non-useful.

When we come to consider the two classes closely, however, we find that they are more intimately related than is implied by this sheer distinction, both in origin and in purpose. I will speak first of their origin. Since the time

far side of the table, not only performs a life-serving function, but also gives publicity to his lack of manners. Just so the movement of running away expresses fear, the movement of striking expresses anger, the movement of carrying a hod of bricks up a ladder expresses toil. Even covert processes may have this function, as when accelerated beating of the heart in excitement appears in the temporal artery or defective secretion of bile gives a yellow cast to the complexion.

of Darwin, and especially since the publication, in 1873, of Darwin's *Expression of the Emotions in Man and Animals*, it has been almost an axiom with scientists that expressive and communicative movements are life-serving functions worn to the butt,—functions reduced, that is, to attitudes and tendencies to action, to mere remnants of their former selves.¹ To give a few familiar examples: What was originally a knock-down blow in anger has now been reduced to a futile clenching of the fist; what was once an actual biting of a foe, has become a gnashing with the teeth at a safe distance; what was once a prostration of oneself at the feet of a superior, has become an inclination of the head. Much ingenuity has been expended in thus tracing the origin of grimace and gesture. Henle explains the clapping of hands for applause as a symbolic abridgment of an embrace. The flaring of the nostrils in violent rage has been interpreted as a remnant of that lively epoch in the life of primitive man when two foes, their teeth buried in each other's flesh, drew back the wings of their nostrils in order to take breath. Without going to such length as this, we may at least trace the shake of the head in negation to the avoidance of unpleasant food, the sudden raising of the arm in fright to an original shielding of oneself from a blow or the attack of a wild beast, pointing with the finger and beckoning, to clutching movements in seizing food or in drawing another person toward oneself. And so on through a long list.

But not only are the expressive-communicative movements derived, by a wearing-down process, from the life-serving movements, they are also, like the latter, useful. Their use, however, is different. The life-serving movements are useful in preserving and promoting the life of the

¹ This theory has been fully elaborated by Dewey, *The Theory of Emotion*, *Psychological Review*, vol. 1, p. 553.

individual. The expressive-communicative movements, on the other hand, since they are the means by which individuals are bound together in a social group, are useful in preserving and promoting the life of society. I have said that an isolated individual could apparently dispense with them and yet preserve his bodily integrity. But it must be remembered that as a rule individuals do not and cannot live in isolation. They live and must live in families, groups, and communities. Consequently in the higher forms of life a condition of things frequently comes about such that individuals must coöperate with one another in order to preserve their existence and continue the species,—the preservation and progression of individual life depending directly upon the organization of social life. In such case intercommunication becomes an absolute necessity. If food, for instance, in the form of an elephant cannot be obtained without calling or beckoning to one's fellows, the ability to call or beckon is as useful as the eating of the elephant-meat. Similarly, if the repelling of an attack demands the coöperation of the clan as a whole, the means of summoning the clan and directing their mode of defense is no less useful than skill with club or javelin.¹

It would appear, then, that expressive and communicative movements are movements which have lost their primitive life-serving functions only to be reinstated in a different function of an equally useful character. They have ceased to sustain the life of the isolated individual in order that they may sustain community life.

If the relation between these two categories of move-

¹ In like manner, to rise to a higher plane, if spiritual life and progress be the end in view, if existence without it is intolerable, the means of intercommunication which will conserve and propagate spiritual life—say, for example, the maintenance of free speech—is as distinctively a life-serving process as eating, sleeping or breathing.

ments is such as I have indicated, the question at once arises: By what steps or stages have functions originally life-serving passed over into society-serving functions? How have muscular contractions whose original purpose was to secure food, to repel enemies, to escape dangers, to secure a more favorable environment, been transformed into muscular contractions whose sole purpose is to express feelings and states of consciousness, and to communicate these feelings and mental states to others?

I will begin my answer to this question by pointing out that in the evolution of bodily movement from the individual-serving to the social-serving stage, we may distinguish certain grades. The lowest grade is that of the recognition-sign, by which in any group the presence and identity of one member are revealed to his fellows. Just as among the fishes certain marks and contours and motions enable the male to distinguish the female of the same species, just as among the social ants the sense of smell enables the ants of one colony to distinguish those of a friendly or a hostile colony, so in the lowest human societies movements of various kinds have enabled members of a given community to identify one another and to comport themselves in such a way as to maintain and advance social integrity.

All overt life-serving movements possess this lowest grade of expressive and communicative function. Even in our present highly organized social relations, we depend to a considerable degree upon these low-grade recognition-signs for judgments of identity. We know our acquaintances by their walk, by their pose, by the carriage of the head or swing of the arms. "That thou art my son," says Falstaff, "I have partly thy mother's word, partly my own opinion, but chiefly a villainous trick of thine eye and a foolish hanging of thy nether lip, that doth warrant me."

In how many cases do we not fail to recognize an old acquaintance until a peculiar lift of the chin, or wrinkling of the brow, recalls him suddenly to our remembrance? ¹ Such distinguishing marks must have been of great value in the early history of mankind in sharpening the vague, inchoate sense of personality,—in enabling the mother, for example, to know her child, and the adult to recognize his clansman.

But the movement which serves as a recognition-sign may pass to a higher stage. It may become a voluntary communication. The process by which this comes about is so complicated and an explanation of it is so essential to my thesis, that I may be pardoned for dwelling upon it at some length. I will be as un-technical as I can.

In the first place it must be remembered that, psychologically speaking, the motives to all voluntary acts are mental images of involuntary acts previously performed. "When a particular movement," says Professor James, "having once occurred in a random, reflex, or involuntary way, has left an image of itself in the memory, then the movement can be desired again, proposed as an end, and deliberately willed. But it is impossible to see how it could be willed before."² An illustration may be taken from that most fundamental of life-serving functions—the taking of food. If I voluntarily reach out my hand for food, it is because a previous involuntary act has traced in my mind an image

¹ For a striking illustration of the psychical value of a seemingly trivial gesture, see May Sinclair's story, *The Fault*. Compare also the following: "Der Eunuch Euläus war der höchste Bewunderer dieser Füße [*i. e.*, of Cleopatra, as she lay at the banquet], nicht, wie er vorgab, um ihrer Schönheit willen, sondern weil das Spiel der Zehen der Königin ihm gerade dann zeigte, was in ihr vorging, wenn aus ihrem in der Kunst der Verstellung wohlgeübten Mund und Auge nichts, was ihre Seele erregte, zu erkennen vermochte."—Georg Ebers, *Die Schwestern*, 8. Kap., S. 112.

² *Principles of Psychology*, vol. II, p. 487.

of myself grasping the food and carrying it to the mouth. The image serves as the motive to the act. I seize the food because I wish to make this pleasing image a reality.

In the second place I must be allowed to assume that the desire of primitive man to coöperate with those of his own group,—of the mother, for example, to help and coöperate with her child,—is at least as fundamental as the desire to fight and kill. Appeals for help or movements which show that help is needed will, therefore, meet with a response from other members of the community. The mother who perceives from the actions of her child that it desires food, will place the food within its reach. A man who sees that his clansman is in danger will go to his aid. Generally speaking, each member of a community is prompted by the social instinct to render to his fellows the services which will promote the integrity of the community.

How these individual and social motives operate in transforming a life-serving act into a true communication, may be illustrated most simply by tracing the genesis of a familiar gesture. I will take for this purpose the gesture or attitude of pointing. In its original form this gesture is the act of seizing or clutching. Its primary purpose is the acquisition of food.¹ Such a movement also serves as a recognition-sign, disclosing to others the presence, and to some extent the identity, of the individual making it, and also revealing his hungry condition. If a supply of food were always present, the act would never rise above its primitive stage. As often as the individual felt the need of food he would reach out his hand and take it. But the source of food-supply, especially in the case of the very

¹ Or of whatever else is necessary. For simplicity's sake I use hunger as a typical motive.

young, is not always within reach. The hand goes out towards it in vain. The stomach remains empty, and the futile clutching movement is merely a sign of increasing hunger.

If, now, when such a movement is made by the child, the mother places the food within its reach, the clutching takes on a new aspect. The movement was at first completed by the act of the child; it is now completed by the act of the mother, since a part of the movement which was formerly made by the child alone, is supplied by the mother's movement. This vicarious completion of the child's act has important consequences. If the original image in the child's mind which supplied the motive for the act, was an image of itself grasping the food, that image has now been supplanted by one which also includes the image of the mother's coöperation. When the child performs the act a second time, the motive to it will be not an image of itself grasping the food with its own hand, but an image of a coöperative grasping, in which the mother's act supplements its own and coalesces with it. The effect of this is to abort or abbreviate the movement, for since part of it is to be performed by another, the whole movement need not be made. All that is necessary is a reaching toward the object; the mother will do the rest. Hence, in course of time, the grasping part of the movement will be abandoned. The clutch will be shortened into a mere thrust of the hand accompanied by an expectant look at the mother. The life-serving movement of clutching will have passed over into the gesture of pointing.¹

It is important to notice how in this process the character

¹ Cf. Wundt, *Völkerpsychologie*, I, S. 129: "Nach so oft wiederholten vergeblichen Versuchen, die Gegenstände zu ergreifen, verselbständigt sich dann erst die Deutebewegung als solche." Wundt fails to explain, however, how the transition is effected.

and value of the movement has been affected. In the first place the movement has been *socialized*. What at first related solely to one individual has now been connected with another individual. From a selfish, self-centered impulse to seize and appropriate, it has been transformed into an appeal for help. It is now made in its modified form with the expectation that another will coöperate to secure the end in view.

But in the second place it has been made *symbolic*. The abbreviated movement, through the intervention of another, has come to stand in the child's mind for the whole movement. It now means "Help me," or "Feed me," or "Please pass me the bread." It is more than a muscular contraction; it is an indication or sign of the child's desire, voluntarily directed towards its kin.

To sum up: The individual life-serving movement of clutching has, through response and coöperation, passed over into the socialized, symbolic attitude or gesture which is called pointing.

Assuming that the process I have described is fairly typical, I shall now attempt to apply this view of the nature and origin of expressive-communicative movements to speech. If speech is, as I have said, a movement of the vocal organs analogous to movements of the head, arms, face, etc., the fundamental problems of its genesis appear to be as follows:

1. Of what life-serving function is speech a survival or development?
2. By what steps or stages has the original life-serving function been transformed into an expressive and communicative function?

With regard to the first question, if we consider how intimately the most elementary phenomena of speech are related to the musculature of the thorax and diaphragm, we

shall see some reason for suspecting that the life-serving movement from which speech has arisen is ordinary respiration. Such, at any rate, is the hypothesis which I shall adopt. Speech, in its inception, is significantly modified breathing. Just as gesture arose from movements of the hands in obtaining food or warding off enemies, so speech arose from the movements of the muscles of the thorax and diaphragm in obtaining a fresh supply of oxygen and in rejecting the harmful products of physiological combustion.

Starting with this postulate, I shall proceed to the second question: By what steps or stages has this life-serving and indispensable process of breathing been transformed into the expressive and communicative function which is termed speech?

Five different kinds of breathing are distinguished by the biologists, namely, intestinal-breathing, skin-breathing, gill-breathing, bucco-pharyngeal breathing (as in frogs), and lung-breathing. The last is the dominant method in man. It is marked off from all the rest, except gill-breathing, by the fact that the interchange of oxygen and carbon dioxide takes place not uninterruptedly as in intestinal and skin-breathing, nor at irregular intervals, as in frogs, but rhythmically. Although it is to a certain extent under control of the will, it cannot be suspended for more than a few seconds without discomfort.

Breathing is the result of a demand of the system for a certain kind of food, namely, oxygen. It is analogous to the movement of a starving man in reaching for a loaf of bread. It differs from the latter movement mainly in the fact that the process of assimilation is much more rapid. If the digestive system were of such a character that repletion and starvation succeeded each other at intervals of a few seconds, the analogy would be complete. The hand, in that

case, would go out rhythmically for the food at brief and regular intervals.

The inhalatory movement of the air supplies oxygen to the circulatory system, the exhalatory movement rejects the waste products. In both cases the air passes through the narrow channel of the throat and mouth or nasal passages. If this channel is wide open and wholly unobstructed, the rush of air in normal slow breathing makes, especially in the nasal passages, a faint rasping sound such as is produced by drawing a finger across the surface of smooth paper. I shall call the sound produced in this way a *respirate*. Increase in the rate or force of breathing under excitement increases the loudness of this sound. After intense exertion, when the system has great need of oxygen and also a great accumulation of waste material to throw off, the *respirate*, even when the mouth is open and the air-passages are relaxed, may become so loud as to be audible at a considerable distance.¹

In the beginnings of human life the sound of normal breathing served no doubt as a recognition-sign. It disclosed the presence, and possibly in some cases the identity, of the individual who made it. Nor is it necessary to think of the sound as being loud. Philologists have written of the beginnings of speech as if they consisted of hoarse, shrill cries like the roaring of lions or the shrieking of gorillas, but I see no reason for assuming these violent utterances in the earliest stages of vocal expression. For one thing, the ears of primitive man were much sharper than ours. Slight sounds had greater significance when life was a struggle *à outrance*. Even to us, with our dull senses, faint noises are, in moments of great suspense, fraught with meaning. One

¹ At one of the Henley regattas the panting of an exhausted oarsman could be distinctly heard, amid the confusion of other sounds, at a distance of forty feet.

who wakes in the middle of the night in a lonely house, may be thrown into a spasm of terror by the creaking of a loose board or by the still fainter sound of some one breathing at his bedside. The intelligibility and impressiveness of a sound depend in no way intrinsically upon its loudness, but upon the conditions under which it is produced and heard.

Again, silence is sometimes more powerful than sound, especially if it takes the form of a sudden cessation of the customary. Just as the stopping of an orchestra in a theatre may throw the audience into a state of panic, so, in a circle of primitive men, a sudden pause in the breathing of one of them may very well have raised excitement to a high pitch.

There is another reason, also, why we need not imagine that the earliest communicative sounds were loud sounds. It is that the original contacts between individuals were physical contacts. The psychologists tell us that all the senses were originally senses of touch. The lowest organisms know each other only in this way. To this sense were added in course of time the senses of smell, of taste, of sight, and of hearing; but all retained in some measure this original function of touch. They were all means by which one body came into physical contact with another body. It follows that the earliest social consciousness was the consciousness of a bodily contact by which the movement of one individual was transmitted directly to the senses of another.

“Even among the higher animals that can distinguish their own and other species by sight and hearing,” says Professor Giddings,¹ “and among mankind, touch survives as a fundamental test which is over and over resorted to in obedience to an unconquerable instinct or habit. Horses,

¹ *Principles of Sociology*, p. 107.

cattle, sheep, and dogs perfect acquaintance by touching and rubbing one another. The embrace, the hand-clasp, and the kiss are survivals of the primitive way of making and renewing acquaintance among men and women. They survive because, as Guyau profoundly observes: 'Le toucher est le moyen le plus primitif et le plus sûr de mettre en communication, d'harmoniser, de *socialiser* deux systèmes nerveux, deux consciences, deux vies'; because it is 'par excellence, le sens de la vie.'"

We must, then, seek for the beginnings of communication, and the beginnings of speech, in what a recent novelist has called "the horrible intimacy" of domestic life—that is, in the closest physical contacts. From a variety of such contacts¹ we may select as a typical example the relations of mother and child. When the infant is resting on its mother's breast, the two bodies are in intimate physical union. The child's body, is, as it were, a part of the mother's body. Every movement of the child, every thrill, every shudder, every breath, even every heart-beat, communicates itself instantly to the senses of the mother. On the other hand, the mother's body, her movements, her breathing, her starts of alarm, are part of the most intimate experiences of the child. As far as physical contact can go, each shares as fully in the consciousness of the other as if they were parts of the same organism.

In such close contact the rise and fall of the child's abdomen and chest in the process of respiration, as well as the warmth or moisture of its breath upon the mother's body, is, we may suppose, a constant indication to the mother of the life and condition of the child.²

¹ I purposely omit, while recognizing its importance for the discussion, the question of the relation of the sexes.

² This view receives confirmation from the well-known fact that the sense of hearing was originally a shake-organ, the sensations of noise having

The beginnings of speech are, then, to be sought in the movements of breathing and the respirates, or relatively faint sounds, produced by the passage of the breath through the unobstructed throat. These movements and sounds may have, as I have shown, a communicative value. Variations in the rate of breathing and in the loudness of the sounds may serve to express a physical condition or a social situation, and to convey the existence of such condition or situation to others, especially from the child to the mother and *vice versa*. We have now to consider how these movements and sounds may be still further varied and especially how the sounds may be enhanced.

Aside from the increase in rapidity and force of exhalation and inhalation, the most important means by which the current of breath becomes variously audible is partial or complete closure of the vocal passages. If the sides of the passages approach one another at any point, the air in its inward and outward flow is compelled to move at a higher rate of speed. The result of the increased friction is a louder sound. Should the passage close completely, the movement of the air ceases and there is silence; but the necessity of inhaling and exhaling at fairly regular intervals soon compels the obstruction to give way. The walls of the air passages separate, and the air rushes in or out with some violence, causing at the moment of separation an explosive sound,—a cough, grunt, catch, etc., if the breath is exhaled, a gasp, gulp, click, etc., if the breath is inhaled.

The causes of these constrictions are various, but are chiefly of two kinds: (1) ordinary physiological processes, (2) strains or tensions of the whole body. Let us consider first the effect of certain physiological processes.

developed before the sensations of tone. "All sensations of hearing," says Professor Titchener, "have been in some way developed from sensations of jar or shake which were not heard at all." (*Primer of Psychology*, p. 43.)

Of the constrictions of the air-passages due to purely physiological causes, those connected with the assimilation of food, namely with mastication and swallowing, and with the rejecting of food, are the most interesting, not only because the digestive apparatus and the lungs are genetically the same organ and still maintain an intimate connection, but because to these processes may be traced some of the most familiar uses of the vocal organs;—laughter, for example, to the taking of food (or at least to movements which promote digestion), crying to the rejection of food.¹ It is obvious that both gorging and disgorging² necessitate a temporary closure of the respiratory channel, after which the lungs, if full, relieve themselves, or if empty, refill themselves, by a violent effort. In either case the air rushes with abnormal force through the reopened passages. Sounds of laughter, I need hardly say, are mainly connected with the expiratory movement, sounds of crying with the inspiratory movement.

Other constrictions due to physiological causes are to be found in sneezing, snoring, coughing, spitting, groaning, hiccuping, choking, grunting, and gulping.

The closures which accompany these various physiological processes occur at different points in the vocal passages. In some the constriction takes place at the glottis, in others at the epiglottis, in still others the soft palate is involved.³

¹ See the interesting and suggestive article on *Crying*, by A. Borgquist, *American Journal of Psychology*, vol. 17, p. 149.

² According to Furness, *Home-Life of the Borneo Head-Hunters*, nothing is more characteristic of savage life than the ravenous devouring of food. The savage grace before meat in Borneo is 'Eat slowly.' An overplus of food, or a modicum of poisonous food, is commonly rejected by the spontaneous recoil of the digestive system.

³ On the function of the epiglottis in modifying vocal sounds, see Czermak, *Sitzungsberichte d. K. Akademie d. Wiss., Wien, Math.-Nat. Klass.*, 1858, xxix, S. 557 (reprinted in *Ges. Schriften*, I, 555), and Scripture, *Experimental Phonetics*, pp. 274, 279.

Thus it may be seen that from purely physiological causes may arise a considerable variety of closures and resultant sounds, all indicative of corresponding bodily states.¹

A second class of constrictions result from the sympathetic action of the throat-muscles, and other muscles, under the influence of bodily strains of various kinds. That strains arising from violent efforts of any sort tend to close the vocal passage, is easily demonstrated.² If any one of those who are sitting before me will, after taking a full breath, pull violently at the arm or rung of his chair, he will find that his glottis has closed involuntarily. The immediate reason for this is that when the air-passages are open, the thorax affords an insecure basis for the strain of the arm-

¹Such sounds as these are frequently said to be meaningless. Thus Jespersen (*Progress in Language*, p. 361) speaking of the phonation with which he conceives speech to have begun, says: "Originally a jingle of empty sounds without meaning, it came to be an instrument of thought." Aston also characterizes spitting, gulping, and coughing as "non-significant human vocal sounds" (*Japanese Onomatopoes and the origin of Language, Jnl. Anthropol. Inst.*, vol. 23, p. 332). Although significance is a relative term, it seems to me unscientific to apply the word non-significant to any vocal sound which reveals bodily states or affects social relations. In primitive society the sound of sneezing, for example, may at times have been as significant for human events then and there, as are the most solemn words of our modern vocabulary. To take an extreme case, a sneeze which revealed the presence of an individual to his enemy may have resulted in death. The sentence of a judge could do no more.

²Scripture, *Experimental Phonetics*, p. 380: "Experiments on the nervous and mental reactions of the vasomotor system, of the heart, of the muscles, of the sweat glands, bladder, anus, etc., make it probably safe to say that the production of any vocal sound is accompanied by nerve impulses to and from every organ of the body. Vocal sounds of a certain character, such as clear, smooth, energetic phrase in song, become associated with the regulation not only of the vocal muscles but also of those of the arms and hands, and, in fact, of the entire body. The disturbance of any of these by restraint or unnatural posture interferes to a greater or less degree—depending on the individual and on circumstances—with the vocal action. To produce the proper modulation the singer or speaker should put his entire body into the appropriate condition."

muscles ; it is like an unstoppered air-cushion which collapses suddenly when one sits on it. Full and tightly-stoppered lungs, on the other hand, expand and stiffen the thorax and give points of attachment to the muscles of the arms.¹

Of such strains the most important for the present inquiry are those which are correlated with emotional seizures, such as anger, fright, suspense, and the like. Whether the emotion is caused by the strain, as some psychologists believe, or the strain is the expression of the emotion, I shall not pause to inquire. It is sufficient for my purpose to note that the two are in some way connected, and that, in consequence, a constriction of the throat is an invariable accompaniment of violent emotion.

As for the strains themselves, they no doubt can be traced to original life-serving movements whose purpose was to secure food, to resist attack, or to prepare for running away.²

To show how strain and emotion operate in modifying respiration and producing sound, I will take as an illustration one of the most elementary and typical of all emotions, namely, fright. When one is startled, as by a brilliant flash of lightning, the breath is first drawn in sharply, filling the lungs with oxygen as if to nourish the system for a coming struggle. The muscles stiffen throughout the whole body just as they do when one braces oneself to resist attack or prepare for flight, and as a result of this general muscular contraction, the glottis closes abruptly, penning up the air

¹ And to the muscles of the legs as well. Thus the runner in a hundred-yard dash, first taking a full inspiration, closes the glottis tightly, and if closely pressed keeps it closed during the entire race. Cf. the interesting article by Dr. R. Tait McKenzie on *The Facial Expression of Violent Effort, Breathlessness, and Fatigue*, in the *London Journal of Anatomy and Physiology*, October, 1905, p. 51.

² Darwin, *Expression of the Emotions*, p. 284 ; Dewey, *The Theory of Emotion*, *Psychological Review*, vol. 1, p. 553.

behind it. This strained attitude may be held for some little time. The system, however, soon clamors for a fresh supply of oxygen, the lungs discharge their contents, and the imprisoned air, forcing its way with an explosive sound through the constricted glottis, rushes violently through the throat and mouth.

In this series of quickly drawn breath, tightly constricted glottis, explosive opening and violent exhalation, we have what I shall regard as the earliest form of voice proper. It may be termed the vocal unit. For the sake of simplicity I will treat the glottal constriction as the typical form, assuming that closures at other points in the vocal passages illustrate the same principles.

It now remains to show how this elementary form of vocal utterance may pass over into a communicative sign. This will be the less difficult because the process of transformation is so closely analogous to that by which the clutching movement of the hand and arm passes into a gesture of pointing, that the terms used to describe one phenomenon may be applied to the other almost without change. Thus the clamor of the stomach for food is analogous to the clamor of the circulatory system for oxygen, the only difference being in the kind of nourishment demanded. Again, the grasping movement of the hand is paralleled by the movements of the diaphragm and of the intercostal muscles which expand the chest.¹

To continue the analogy, since an important factor in the development of the pointing gesture was the absence of food, we must, in the case of breathing, look for a condition which will check the supply of oxygen. This we can readily discover in the closing of the glottis, or other parts

¹ Nor is the comparison merely fanciful. The lungs hunger for their proper food. A diver rising to the surface after a long stay under water "clutches" the air as fiercely as a starving cat clutches a piece of meat.

of the air-passages, under the strain of fright or suspense, or through physiological disturbances. The feeling of suffocation caused by the failure in the supply of oxygen is precisely parallel to the feeling of distress caused by the failure of the hand to grasp the food.

The terms of the analogy being now complete, we are ready to inquire how the transformation takes place which converts the life-serving function into a communicative function. For the sake of a concrete example let me at this point recur to the case of the mother and child. When the child is frightened, its glottis closes involuntarily, shutting off the supply of oxygen and causing a feeling of suffocation. If, now, the mother by her comforting caress or embrace, relieves the tension, sets the breath free, and restores the normal respiratory rhythm, the unstopping of the vocal passages will henceforth be associated with her act. She has coöperated with the child in the satisfaction of its craving for oxygen. She has put the food within its reach. And just as the act of clutching is trimmed down and reduced to an appealing forward thrust of the hand or to an attitude, so is the total series of muscular movements involving constriction of the glottis, long holding of the breath, and explosive release, molded by the mother's response into the characteristic form of communicative speech.

That this form does not resemble the gesture of pointing in all respects, is due to the fact already noted, namely, that respiration, unlike movements of the arms, is an incessantly rhythmical process only in part under the control of the will. A baby may hold its breath until it is black in the face, as babies of the present day frequently do to the terror of their mothers, but sooner or later the imprisoned air must be let out and a fresh supply taken in. In other words, constriction of the air-passage cannot

become an attitude. Nevertheless the effect of the mother's response upon the child's series of breathing movements is analogous to its effect upon the clutching movement in that the series, when its communicative value is perceived, need not be given in its fullness. It is completed by the mother's response. Hence the duration of each part of the series is reduced, and the violence of the latter part diminished. The long continued constriction, followed by a hoarse rush of breath or a scream, is softened into a glottal catch, followed by a comparatively slower emission of the breath, diminishing rapidly in intensity.

The earliest communicative vocal utterance was, then, I conceive, a glottal stop,¹ or some sound resembling it, followed by a voiced or voiceless sound, which increased in pitch and intensity to a certain point, and then diminished in the same qualities to the close.

Closures at other points in the air-passages would result in other sounds,² but as all would involve the same principle, a description of them would contribute nothing to the solution of the fundamental problem. At any rate I shall not consider them here.

That sounds produced and modified in the way I have indicated, would in the process be socialized and made symbolic like the pointing-gesture, may be taken for granted.

I need hardly say that such an utterance as I have described was not a word. Neither was it a sentence, in any proper sense of that term, though it more nearly resembled the latter than the former. Precursor of both

¹ I use this term, it must be remembered, to indicate any constriction of the lower part of the air passage. 'Tracheal stop' would be more precise.

² For example, as others have surmised, the nasal stop involved in suckling may have given rise to the sound *nga*, *na*, or *ma*, which in 80 per cent. of all languages is the word for mother.

word and sentence, it was a protoplasmic speech-form in which an entire situation was inchoately expressed and communicated. Within it were embraced emotional seizure, instinctive appeal to its kind for help, discharge of feeling, consciousness of self, and consciousness of coöperation. If there was to the child any differentiation in the utterance, it consisted in this, that the first part of the series of movements pertained more closely to itself, the latter part pertained more closely to its mother.

I have now tried to show how, in the early history of mankind, even prior to the full development of the vocal chords, the passage of air through the respiratory channel may have produced a variety of sounds. I have tried also to show how these sounds, together with the muscular movements which occasioned them, may, under the condition of close physical contact, as in the case of mother and child, first have served as recognition-signs, then, through the response of the mother to the child's implicit appeals for help, have developed into true communications. Still further, I have attempted to show that the successive stopping and unstopping of the breath, owing to the necessarily rhythmical character of the respiratory act, may have caused a succession of consonantal and aspirate, or consonantal and sonant, sounds which would form the basis of articulation.

It remains to consider by what stages the symbolic representatives of bodily states or social situations may have come to stand for particular ideas.

Since all speculations of this kind are imaginative reconstructions of the past, I will, for variety's sake, venture to recount the process of evolution as it may actually have occurred.

If we could, by the aid of Mr. Wells's time-machine, transport ourselves back to the period when speech was

beginning, and could then, by leaps of a century or a millennium, approach our own era, we should probably witness such conditions and changes as the following.¹ At the beginning we should find the creatures who are to become men, perhaps the only voice-producing mammals in creation. Their voices, however, owing to the rudimentary condition of the vocal apparatus, are little more than buzzings, hoarse whispers, or faint cries, following abrupt closures of the air-passages at the glottis, the epiglottis, the root of the tongue, the palate, and the lips. These sounds increase in volume and rise in pitch in moments of excitement or of physiological disturbance. At this early period, they serve among adults only as recognition-signs by which one detects the presence of his kind in the dark or through intervening obstacles. But if we observe the relations of mother and child and note the development of their intelligence, we shall perceive the dawning of a higher use. Imagine, if you please, a primitive mother and her sleeping child. The mother clasps the child to her breast. As long as she feels and hears its regular breathing, she is content, for to her dim intelligence this rhythm of respiration is a sign of life and health. If at intervals the child stirs restlessly, she perceives, through her physical contact with it, not only the movement of its body, but also the irregularity of its breathing. Now, we may suppose, it wakes in fright, drawing its breath in sharply and stiffening all its muscles. The passage of the throat closes, the breathing stops. The cessation of the customary movement alarms the mother and excites her sympathy. She fondles the child, and at her comforting touch the glottis opens with an explosion, and the breath rushes out in a whisper or faint

¹ For the sake of simplicity I will confine myself to a single phenomenon.

cry, which diminishes in intensity as the fear passes away. The breathing again becomes regular. Trivial as this little series of events may seem, it has traced in the simple brains of both these beings a record of momentous importance. On the part of the child, the emotional seizure, the desire for protection, and the instinctive muscular contraction with its resulting constriction of the throat, are combined with the image of the caress and with consciousness of a pleasurable relaxation of tension. The spasmodic movement to resist attack or escape from imagined danger has been completed by the mother's act. A consciousness of the social value of stopped and unstopped breathing has been awakened.

On the mother's part also, the sudden tension of the child's body within her arms, which conveyed to her its emotion of fear, has been connected with its vocal sounds, just as her instinctive caress has been connected with the cessation of the sound and the restoration of the child's normal condition. She realizes vaguely the value of its interrupted breathing as an appeal to her for aid.¹

We set our machine in motion and pass down a score of generations. The voices have grown louder as the vocal chords have developed with use. But the multiplied records of tension, sound, response, and achievement of desire, transmitted from one generation to another in a more highly developed brain-structure, have produced a remarkable change in the relations of mother and child. The value of the vocal unit as a means of intercommunication has been enhanced. The connection in the child's consciousness between the muscular sensations of the thorax,

¹ Fanciful though this description may be, it was suggested in all its outward details by the behavior of a mother and baby *Macacus* in the London Zoölogical Gardens.

vocal organs, etc., and the mother's response to the resulting sounds, is so firmly established that the cry is uttered with the expectation that it will be responded to. The child cries *at* the mother. The mother, on her side, imitates the cry, partly through the instinct of imitation, but also because the sound of her voice is a part of her feeling for the child. The movement of her hand and the constriction of her throat are, in fact, a single complex innervation. She recognizes also the value of the cry as a response to the child's appeal, since together with the caress it restores the normal respiratory rhythm.

As we go on down the centuries we see these vocal sounds growing in value and importance as the sound frees itself to some extent from the movements which originally gave rise to it. When the recollection of a painful experience innervates the muscles of the child's throat and produces the cry of fright, the mother, if she sees no real occasion for fear, gives only the comforting vocal response. Thus the sound is, in a measure, detached from its original cause, while remaining significant of it. In other words, it becomes a symbol of the relations between the two.

At a still later stage we shall find this sound attaching itself to some particular element in the situation which, with their growing intelligence, both are now able to distinguish. Because this element is most prominent, or because it occurs most frequently, the sound becomes more closely associated with it than with the rest of the complex. When the sound is uttered on either side, it calls into consciousness, as before, the entire situation; but since the stress of attention now falls upon the particular element which in both minds is most typical or most characteristic, the sound which before expressed for each, and communicated from one to the other, an emotional seizure, now denotes a particular element in the exciting cause. The

unimportant details of the situation retreat into the background, leaving the typical feature in isolation; out of the emotion emerges that sharpened state of consciousness which we call an idea. What this typical feature is will depend upon the experience of the individuals. In the case of the emotion we have been considering, it may be a flash of lightning, thunder, the cry of a tiger, the crackling of a twig under the foot of a prowling enemy, the dividing of the grass marking the approach of a poisonous snake, or a pain in the stomach. In any case, the vocal sound has been so often interchanged to convey the state of fear which this object of terror arouses, that the utterance of it calls up infallibly in the mind of each the image of this particular element in the dangerous situation.

As we flit by the succeeding generations, we note that the number of these significant respirates increases. Different situations cause different kinds of strains, and these again, resulting in different sorts of constrictions of the throat and varying shapes of the resonance chambers, produce in their turn a variety of vocal sounds, symbolizing the most elementary relations of mother and child. At first unstable and sporadic and confined to single families, these little vocabularies die out of use as rapidly as they are born, and a new set springs up in each succeeding generation. But in course of time, as the mind becomes more retentive, the growing child holds fast to his infantile vocabulary. A bridge is thus made from one generation to the next. The vocal creations of the past are conserved and added to. A tendency is established, which out of the manifold creations of each new generation selects for survival those which are analogous to the old, and rejects the remainder. These usages spread from one family to another. The latest arrival in the community finds himself in the midst of a group who will attend to his needs only when he uses the

sounds which others use, and only when he uses them with the meanings which others attach to them.

We shall see hundreds and thousands of these little systems of speech springing up, competing one with another and passing away. In the struggle for existence we may conceive either that the fittest group survives, together with its mode of speech, or, what is more probable, that (other things being equal) the group with the best language-system, since it is able to give more explicit instructions for the organization of defense and attack, gets the start of the rest, and perpetuates both itself and its system of communication. Thus a particular vocabulary, at first confined to a single group, may come to dominate a wide area.

But we need pursue our imaginary flight no farther, for we have left the period of genesis behind; we have entered upon the period of transmission in which we find ourselves to-day.¹

¹ It will be observed that among the factors of speech-genesis I have given but a modest rôle to imitation. Considering the great importance which philologists have assigned to the imitative instinct, this view may excite surprise and at least deserves a word of explanation.

It must be apparent to persons who are familiar with the recent literature of psychology, that the imitation-theory, not only with respect to speech, but with respect to origins of mental aptitudes of all kinds, especially in infants, has been sadly overworked. Imitation has been treated as a purely reflex and mechanical act, as an inscrutable instinct prompting men and animals to repeat exactly the movements of others or to reproduce in one way or another certain natural phenomena. The truth is, however, as Professor C. H. Cooley has well said, that much of what we call imitation is a difficult and complicated exercise of attention, will, and even judgment. It is more characteristic of adults than of the very young. Referring to the speech of young children, Professor Cooley says: "The imitativeness of children is stimulated by the imitativeness of parents. A baby cannot hit upon any sort of a noise, but the admiring family, eager for communication, will imitate it again and again, hoping to get a repetition. They are usually disappointed, but the exercise probably causes the child to notice the likeness of the sounds and so prepares the way for imitation. It

Let me say in conclusion that I am far from thinking that the processes involved in the genesis of speech are so simple as I have made them, for purposes of brevity and clearness. My sketch is, as the physiologists say, diagrammatic. I have left out of it the details which, however necessary to a finished picture, seem to me nevertheless to confuse the main outlines. If the picture is true as far as it goes, the details can be readily filled in. If, on the other hand, it is false, its very bareness and simplicity will make the errors more easy of detection. In either case I shall be content if my paper, by stimulating other minds, leads to a reconsideration of this ever-abandoned, ever-renewed, baffling yet perennially fascinating problem.

is perhaps safe to say that up to the end of the first year the parents are more imitative than the child." (*Human Nature and the Social Order*, p. 25.)

Applying this principle to the genesis of speech, we may say that the primitive mother's imitation of the child's irregularities of respiration are a more potent factor in the development of speech than the child's imitation of the mother, or of anything else. The so-called imitation words *pop*, *crack*, *bang*, *sizzle*, and the like are probably late creations. Primitive man must have attained to a relatively advanced stage of intelligence and discriminative power before he detected the similarity of the sounds he was making with his breath to the sounds made by the forces and objects of nature—to the rippling of streams, the murmuring of the winds in the trees, or the rolling of thunder in the clouds. (Cf. Wundt, *Schallnachahmungen und Lautmetaphern in der Sprache. Beilage zur Münchener Allg. Zeit.*, 16. Feb., 1907.) I say nothing about the sounds made by other animals, because, as I have said before, I assume that man or his precursor was the earliest of his kind to develop voice.